Claims

[c1]   1.A computed tomography (CT) reconstruction method, the method comprising:

implementing an iterative image reconstruction process for CT metrology of an object, wherein said iterative reconstruction process utilizes an accurate forward projection.

[c2]   2.The method of claim 1, wherein said accurate forward projection includes using a polychromatic x-ray acquisition model.

[c3]   3.The method of claim 2, wherein using a polychromatic x-ray acquisition model further comprises:

decomposing a linear attenuation coefficient into a photoelectric component and a Compton scatter component; and

constraining a relative weight of said photoelectric component and said Compton scatter component based on prior material assumptions.

[c4]   4.The method of claim 1, wherein said accurate forward projection includes incorporating finite x-ray beamwidth considerations, said finite x-ray beamwidth considera-

tions including at least one of: detector point-spread function, detector aperture, detector cross-talk, focal-spot size, off-focal radiation, azimuthal blur, and detector memory effects.

[c5] 5. The method of claim 1, wherein said accurate forward projection includes incorporating scatter radiation considerations.

[c6] 6. The method of claim 1, wherein said iterative image reconstruction process implements at least one of: an iterative filtered back projection (IFBP) algorithm, a maximum a posteriori probability (MAP) algorithm, a maximum likelihood (ML) algorithm, an algebraic reconstruction technique (ART) algorithm, an Entropy-based algorithm, a Least Squares (LS) algorithm and a Penalized Weighted Least Squares (PWLS) algorithm.

[c7] 7. A method for implementing an iterative reconstruction of a computed tomography (CT) image, the method comprising:
during each of a plurality of iterations, generating a reconstructed image;
constraining said reconstructed image by utilizing prior outer edge information obtained from a modality in addition to CT;
transforming said reconstructed image to a projection

domain so as to generate a calculated sinogram; and determining at least one of a correction image and a corrected image based on said calculated sinogram and a measured sinogram.

[c8]   8.The method of claim 7, wherein modality in addition to CT further comprises one of: a coordinate measuring machine (CMM), a micrometer, and a laser-based measurement system.

[c9]   9.The method of claim 8, further comprising: following the completion of said plurality of iterations, using a resulting completed reconstructed image and said prior outer edge information to generate a 3D point cloud of the CT image.

[c10]   10.The method of claim 7, wherein said generating a reconstructed image is implemented through at least one of: an iterative filtered back projection (FBP) algorithm, a maximum a posteriori probability (MAP) algorithm, a maximum likelihood (ML) algorithm, an algebraic reconstruction technique (ART) algorithm, an entropy-based algorithm, a least squares (LS) algorithm and a penalized weighted least squares (PWLS) algorithm.

[c11]   11.A method for implementing an iterative reconstruction of a computed tomography (CT) image, the method

comprising:

during each of a plurality of iterations, generating a reconstructed image;

constraining said reconstructed image utilizing prior outer edge information obtained from a modality in addition to CT and transforming said reconstructed image to the projection domain so as to generate a calculated sinogram; and

determining at least one of a correction image or a corrected image based on said calculated sinogram and a measured sinogram;

wherein the iterative reconstruction utilizes an accurate forward projection in determining said calculated sinogram.

[c12]   12.The method of claim 11, wherein said modality in addition to CT further comprises one of: a coordinate measuring machine (CMM), a micrometer, and a laser-based measurement system.

[c13]   13.The method of claim 12, further comprising: following the completion of said plurality of iterations, using a resulting completed reconstructed image and said prior outer edge information to generate a 3D point cloud of the CT image.

[c14]   14.The method of claim 11, wherein said generating a

reconstructed image is implemented through at least one of: an iterative filtered back projection (IFBP) algorithm, a maximum a posteriori probability (MAP) algorithm, a maximum likelihood (ML) algorithm, an algebraic reconstruction technique (ART) algorithm, an entropy-based algorithm, a least Squares (LS) algorithm and a penalized weighted least squares (PWLS) algorithm.

[c15]   15.The method of claim 11, wherein said accurate forward projection includes using a polychromatic x-ray acquisition model.

[c16]   16.The method of claim 15, wherein using a polychromatic x-ray acquisition model further comprises: decomposing a linear attenuation coefficient into a photoelectric component and a Compton scatter component; and constraining a relative weight of said photoelectric component and said Compton scatter component based on prior material assumptions.

[c17]   17.The method of claim 11, wherein said accurate forward projection includes incorporating finite x-ray beamwidth considerations, said finite x-ray beamwidth considerations including at least one of detector point-spread function, detector aperture, detector cross-talk, focal-spot size, off-focal radiation, azimuthal blur, and

detector memory effects.

[c18] 18. The method of claim 11, wherein said accurate forward projection includes incorporating scattered radiation considerations.

[c19] 19. A storage medium, comprising:

a machine readable computer program code for implementing an iterative reconstruction of a computed tomography (CT) image; and

instructions for causing a computer to implement a method, the method further comprising:

during each of a plurality of iterations, generating a reconstructed image;

modifying said reconstructed image by utilizing prior outer edge information obtained from a modality in addition to CT;

transforming said modified, reconstructed image to a projection domain so as to generate a calculated sinogram; and

determining at least one of a correction image and a corrected image based on said calculated sinogram and a measured sinogram;

wherein the iterative reconstruction utilizes accurate forward projection constraints in determining said calculated sinogram.